CLAIMS

1. A hydrodynamic bearing comprising:

a sleeve having a bearing hole at the nearly central portion thereof,

a shaft rotatably inserted into said bearing hole of said sleeve, and

a nearly disc-shaped flange secured to one end of said shaft, one face of said flange opposing to the end face of said sleeve 1 and the other face thereof opposing to a thrust plate provided to hermetically seal a region including said end face of said sleeve, wherein

herringbone-shaped first and second dynamic pressure generation grooves are provided on at least one of the inner circumferential face of said sleeve and the outer circumferential face of said shaft so as to be arranged in the direction along said shaft,

herringbone-shaped third dynamic pressure generation grooves are provided on at least one of the mutually opposed faces of said flange and said thrust plate,

said first, second and third dynamic pressure generation grooves are filled with oil having a kinematic viscosity of 4 cSt or more at 40°C of temperature,

one of said sleeve and said shaft is secured to a base and the other is secured to a rotatable hub rotor, and

when the outside diameter of the herringbone pattern of said third dynamic pressure generation groove is designated as d1o, the inside diameter thereof is designated as d1i, the diameter of the turn-back part thereof is designated as d1m, the diameter of the turn-back part of the herring pattern is designated as d1m, the value of the diameter d1m being in the range of 1 mm or more and 10 mm or less, and the diameter of the turn-back part of the herring pattern, wherein the oil pressure generated by said third dynamic pressure generation grooves in the direction from the outer circumference to the inner circumference of said flange becomes equal to the oil pressure generated in the direction from the inner circumference to the outer circumference thereof, is designated as dsy and is represented by:

$$dsy = \{(d1i^2 + d1o^2)/2\}^{1/2},$$

the diameter d1m of the turn-back part is determined so that the value obtained by subtracting the diameter d1m from the diameter dsy, (dsy - d1m), is in the range of 0.05 mm or more and 0.8 mm or less, that is, d1m = dsy - (0.05 to 0.8 mm).

2. A hydrodynamic bearing comprising:

a sleeve having a bearing hole at the nearly central portion thereof,

a shaft rotatably inserted into said bearing hole of said sleeve, and

a nearly disc-shaped flange secured to one end of said shaft, one face of said figure opposing to the end face of said sleeve 1 and the other face thereof opposing to a thrust plate provided to hermetically seal a region including said end face of said sleeve, wherein

herringbone-shaped first and second dynamic pressure generation grooves are provided on at least one of the inner circumferential face of said sleeve and the outer circumferential face of said shaft so as to be arranged in the direction along said shaft, among said first and second dynamic pressure generation grooves, when the grooves away from said thrust plate are designated as said first dynamic pressure generation grooves and the grooves close thereto are designated as said second dynamic pressure generation grooves,

the first length L1 of the groove portion which is away from said thrust plate in said herringbone-shaped first dynamic pressure generation groove in the direction of said shaft is larger than

the second length L2 of the groove portion which is close to said thrust plate in the direction of said shaft,

when the diameter of said shaft is in the range of 1 mm or more and 10 mm or less, the value obtained by subtracting the length L2 from the length L1 is set in the range of 0.05 or more and 1.5 mm or less,

herringbone-shaped third dynamic pressure generation grooves are provided on at least one of the opposed faces of said flange and said thrust plate,

said first, second and third dynamic pressure generation grooves are filled with oil having a kinematic viscosity of 4 cSt or more at 40° C of temperature, and

one of said sleeve and said shaft is secured to a base and the other is secured to a rotatable hub rotor.

3. A hydrodynamic bearing comprising:

a sleeve having a bearing hole at the nearly central portion thereof,

a shaft rotatably inserted into said bearing hole of said sleeve, and

a nearly disc-shaped flange, secured to one end of said shaft, one face of said flange opposing to

the end face of said sleeve 1 and the other face thereof opposing to a thrust plate provided to hermetically seal a region including said end face of said sleeve, wherein

herringbone-shaped first and second dynamic pressure generation grooves are provided on at least one of the inner circumferential face of said sleeve and the outer circumferential face of said shaft, among said first and second dynamic pressure generation grooves, when the grooves away from said thrust plate are designated as said first dynamic pressure generation grooves and the grooves close thereto are designated as said second dynamic pressure generation grooves,

the first length L1 of the groove portion which is away from said thrust plate in said herringbone-shaped first dynamic pressure generation groove in the direction of said shaft is larger than the second length L2 of the groove portion which is close to said thrust plate in the direction of said shaft,

said herringbone-shaped second dynamic pressure generation groove is made symmetric with respect to a line passing through the herringbone-shaped turn-back parts, and the value of a calculation expression, $(L1 + L2)/(2 \times L2)$ represented by said

first length L1 and said second length L2, is in the range of 1.02 to 1.60,

herringbone-shaped third dynamic pressure generation grooves are provided on at least one of the opposed faces of said flange and said thrust plate,

said first, second and third dynamic pressure generation grooves are filled with oil having a kinematic viscosity of 4 cSt or more at 40°C of temperature,

one of said sleeve and said shaft is secured to a base and the other is secured to a rotatable hub rotor, and

when the outside diameter of the herringbone pattern of said third dynamic pressure generation groove is designated as d1o, the inside diameter thereof is designated as d1i, the diameter of the turn-back part thereof is d1m, and the diameter of the turn-back part of the herring pattern, wherein the oil pressure generated by said third dynamic pressure generation grooves in the direction from the outer circumference to the inner circumference of said flange becomes equal to the oil pressure generated in the direction from the inner circumference to the outer circumference thereof, is designated as dsy and is represented by:

$$dsy = \{(d1i^2 + d1o^2)/2\}^{1/2},$$

the diameter $d1m$ of said turn-back portion is determined so that when the diameter of said shaft is in the range of 1 mm or more and 10 mm or less, the value obtained by subtracting said length L2 from said length L1 is set in the range of 0.05 or more and 1.5 mm or less, the diameter $d1m$ is in the range of 1 mm or more and 10 mm or less, and the value obtained by subtracting the diameter $d1m$ from the diameter dsy is in the range of 0.05 mm or more and 0.8 mm or less, that is, $d1m = dsy - (0.05 \text{ to } 0.8 \text{ mm})$. (FIG. 8)

4. A hydrodynamic bearing in accordance with any one of claims 1 to 3, wherein said pattern is a spiral pattern in which the inside diameter $d1i$ of said third dynamic pressure generation groove is equal to the diameter $d1m$ of said turn-back part.

5. A hydrodynamic bearing in accordance with any one of claims 1 to 4, wherein herringbone-shaped fourth grooves are provided on at least one of the opposed faces of said flange and said sleeve, and when the outside diameter of the herringbone pattern of said fourth groove is designated as $d2o$, the inside diameter thereof is designated as $d2i$ and the diameter of the turn-back part is designated as $d2m$, a relationship represented by $d2m = \{(d2i^2 + d2o^2)/2\}^{1/2}$

is satisfied.

6. A disc rotation apparatus for recording or reproducing signals, wherein a recording/reproduction disc is concentrically secured to said hub rotor of said hydrodynamic bearing in accordance with claims 1 to 5 and rotated, magnetic heads or optical heads are provided so as to be opposed to the faces of said rotating disc, and said magnetic heads or optical heads are configured so as to be movable in parallel with the faces of said disc.